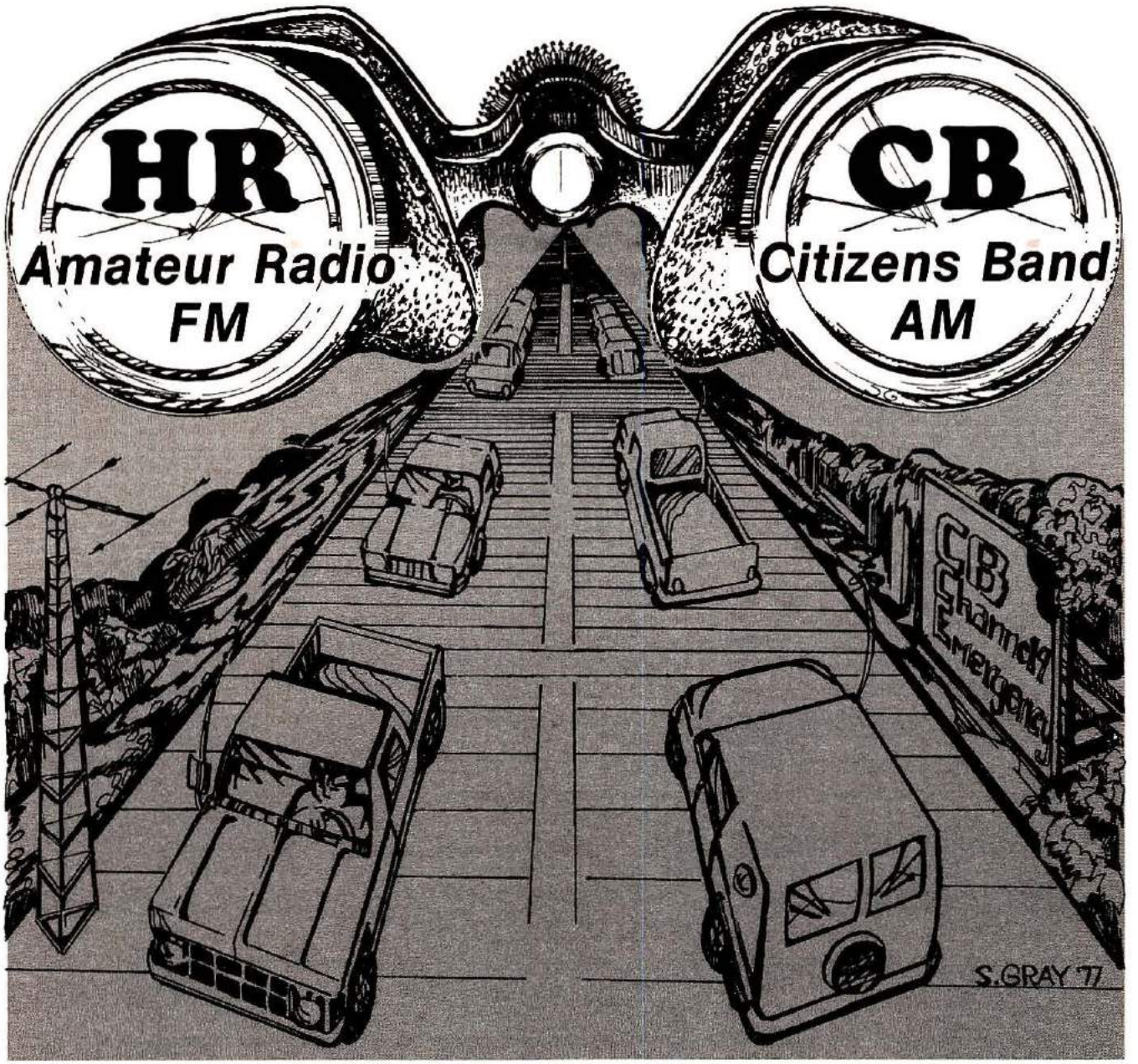


You miss half the picture if you close one eye

BY THOMAS R. SUNDSTROM, WB2AYA

Citizens' Band or Amateur Radio? At one time that question, if asked, on the frequencies occupied by either service, would have raised a discussion — or a heated debate — that might have lasted for hours. But, times are changing, and both radio services are solving their problems; each is taking a new, and careful, look at the other. CBers who enjoy tinkering with equipment and like to take part in round table conversations have found that they are missing a lot of fun by not venturing into Amateur radio. Amateurs who have overlooked some of CB's assets are now beginning to discover that they have denied themselves a useful service.

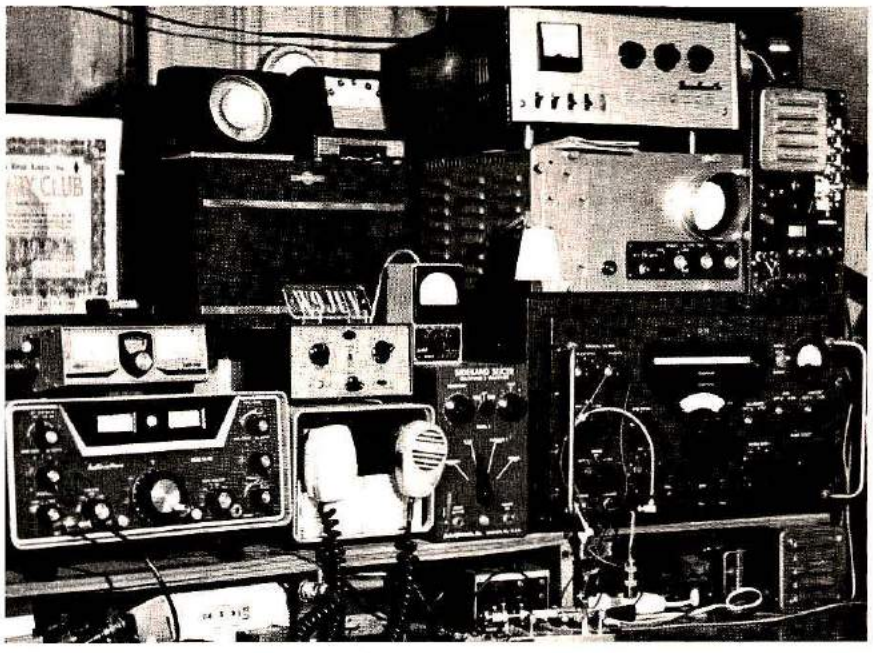
The purpose of this article is to take a closer look at both services and to explore some of the pros and cons of each. Vhf and uhf Amateur-band allocations are rapidly filling with former CBers who now hold Technician class Amateur tickets. Vhf-fm rigs have swept the market, and two meters (144-148 MHz) has turned into the number-one mobile operating band.

Although vhf/uhf fm, and two meters in particular, bears the brunt of this inspection, let me

point out that this is by no means the largest and most enthusiastic section of Amateur radio activity. Two-meter fm probably comes to the attention of more non-amateurs than does the lower frequencies, because, for one reason, there are numerous scanners available that can listen to these repeater bands.

Also, some of the tunable vhf-monitor types of receivers start their frequency coverage at the middle of the Amateur two-meter band. So, the intention is to offer an explanation of something that many non-hams have heard about, rather than to ignore the many attractions of the high-frequency bands, which are a world unto themselves.

Let's look at this recent phenomenon, and see how CB and vhf fm radio can peacefully co-exist.



Amateurs who have been at the hobby for any length of time tend to accumulate a lot of equipment. This station includes gear for all the amateur high-frequency bands, as well as for vhf, uhf, and repeater operation. Some of the equipment is new, some is war surplus, and some is adapted from the commercial two-way radio services.

Authorizations

The Citizens' Radio Service is described by FCC Rules and Regulations as " . . . a radio-communications service of fixed, land, and mobile stations intended for short distance personal or business radio communications . . . "[1] which includes Class D stations "licensed to be operated for radio telephony, only."[2] Class-D authorization is a *station*, not an operator, license; so more than one person in a household or business can legally operate a unit[3] with only a few common-sense restrictions on the types of communication allowed.

A piece of new CB equipment on the scene is this transceiver by Texas Instruments, Inc. All control and operating functions can be selected from the buttons on the combination microphone and control head; there are no knobs on the main chassis. A readout panel on the microphone indicates channel number, mode (upper sideband, lower sideband, or a-m), and signal strength. It can also indicate power and standing-wave ratio.

These restrictions include, among others, prohibition of the " . . . advertising or soliciting the sale of goods," and on transmitting music, or " . . . program material for retransmission . . . on a broadcast facility."[4]

The Amateur radio service is limited to " . . . non-commercial radio communication by or among Amateur radio stations solely with a personal aim and without pecuniary or business interest."[5] A licensed Amateur radio station must be controlled by a licensed operator.[6]

You'll see from these quotations that Class-D Citizens' Band and Amateur radio are markedly different in purpose, in what you are

Table 1 — Frequencies available for Class-D use.

Channel number	MHz	Channel number	MHz
1	26.965	21	27.215
2	26.975	22	27.225
3	26.985	24	27.235
4	27.005	25	27.245
5	27.015	23	27.255
6	27.025	26	27.265
7	27.035	27	27.275
8	27.055	28	27.285
9*	27.065	29	27.295
10	27.075	30	27.305
11	27.085	31	27.315
12	27.105	32	27.325
13	27.115	33	27.335
14	27.125	34	27.345
15	27.135	35	27.355
16	27.155	36	27.365
17	27.165	37	27.375
18	27.175	38	27.385
19	27.185	39	27.395
20	27.205	40	27.405

*restricted to emergency traffic only (Part 95.41 (3)).

allowed to do, and how you are allowed to use your radio. A business, seeking a low-cost two-way radio system must use Class-D or move to an expensive and sophisticated business-radio system. A housewife who does not have an Amateur radio license, but needs two-way radio communication — either at home or when driving in her car — has no alternative but to apply for a Class-D CB license. Note again that Class-D licenses the station, whereas the Amateur Radio Service licenses both the operator *and* the station.

Frequencies

The 11-meter Class-D Citizens' Band Radio Service was created in 1957. Twenty-three frequencies (channels) were allocated in the then-existing 11-meter band, which the Amateurs shared with the Industrial, Scientific, and Medical (ISM) services. The band was then withdrawn from the Amateur Service allocations. On January 1, 1977, an additional 17 channels were allocated by the FCC to alleviate severe overcrowding of the band. Expansion of the Class-D spectrum was limited to 440-kHz between the highest and lowest frequencies to eliminate potential mixing products.[7] Because 455 kHz is a popular intermediate frequency, commonly used in a-m receivers; and because there would very likely be two Class-D signals on the air at the same time and from the same area, the use of band limits spaced apart by 455 or 460 kHz would create interference with every clock radio in the neighborhood.

The 27-MHz Class-D frequencies (**Table 1**) are located in the radio spectrum near the boundary between high-frequency and vhf portions of the radio frequency spectrum. Normal propagation modes on the Citizens' Band are groundwave and skywave. Whereas FCC rules permit contacts at distances of up to 150 miles (240km),[8] with the intent that transmissions be limited to groundwave only, the daily and seasonal cycles of the maximum usable frequency often result in skywave reflections of signals from an ionospheric layer (the E-layer) about 60 miles (95km) up. These "bounces" cause tremendous interference to groundwave signals, and at times makes CB almost useless.

On the other hand, groundwave propagation, only, is normal and expected on vhf and uhf Amateur bands. Other kinds of propagation are *relatively* rare, but can and do occur under certain conditions of weather or solar activity.

The Amateur services are allocated a total of seven vhf and uhf bands above 50 MHz,[9] (**Table 2**) but only four have any significant usage: 50, 144, 220, and 420 MHz. Special attention to equipment, antennas, and engineering design precludes many Amateurs from operating and experimenting on Amateur bands above 450 MHz.

Table 2 — Vhf and uhf Amateur bands above 50 MHz.

MHz	Band
50-54	6 meters
144-148	2 meters
220-225	1¼ meters
420-450	¾ meters
1,215-1,300	23 cm
2,300-2,450	13 cm
3,300-3,500	9 cm

Table 3 — Two-meter repeater and simplex frequencies.

Repeater Pairs	
146. MHz	**147. MHz**
In Out	In Out
146.01 - .61	147.60 - .00
.04 - .64	.63 - .03
.07 - .67	.66 - .06
.10 - .70	.69 - .09
.13 - .73	.72 - .12
.16 - .76	.75 - .15
.19 - .79	.78 - .18
.22 - .82	.81 - .21
.25 - .85	.84 - .24
.28 - .88	.87 - .27
.31 - .91	.90 - .30
.34 - .94	.93 - .33
.37 - .97	.96 - .36
146.40 - 147.00	147.99 - .39

Simplex Channels	
.43	.42
.46	.45
.49	.48
.52	.51
.55	.54
.58	.57

Note: In some crowded metropolitan areas, repeaters using a 1-MHz split may be using 15- or 30-kHz spacings with outputs between 146.415 and 146.49. Inputs are in the 147-MHz range.

Transmission modes

CB uses a rather inefficient amplitude modulation (a-m) system. Half of the transmitted power is used for the carrier which contains no intelligence, while the remaining half is used for two, symmetrical, sidebands of information. Utilizing the principles discussed by *Horizons* Managing Editor Thomas McMullen, W1SL, in "Taking the Mystery Out of SSB,"[10] single sideband is a very efficient mode of communications for the crowded CB channels and ssb is allowed on *all* Class-D frequencies.[11]

The advantage of ssb over a-m is that the maximum bandwidth allowed for ssb (4 kHz) is only one-half of the maximum bandwidth allowed for a-m (8 kHz).[12] Elimination of the carrier gets away from the hetrodyning noise of multiple signals on one channel. Talking range increases, as does intelligibility.

Modes allowed on two meters are a-m, CW, fm, ssb, and RTTY (radio teletype). The band is divided into two sections: 144 to 146 and 146 to 148 MHz. CW is permitted from 144 to 148 MHz, while a-m and ssb are conventionally found between 144.1 and 146 MHz. Fm and some RTTY are usually above 146 MHz.[13]

By specific action, the FCC has also allocated certain frequency bands "for repeater stations, including both input (receiving) and output (transmitting)," which includes the 146- to 148-MHz segment of two meters.[14]

Repeaters are the lifeblood of portable and mobile Amateur stations on vhf and uhf bands, but repeaters are not authorized in the Class-D CB service.

Repeaters

The most obvious difference between CB and vhf fm is the advent of repeaters for radio Amateurs. Fm repeaters are not new; records reveal 5-meter repeater stations in use as long ago as 1932.[15] The mushrooming growth of narrow-band fm equipment and repeaters really took off in the 1970's, and is still gathering momentum.

A repeater extends the range of base and mobile units, to distances of 100 miles (160km) or more, but on these high frequencies, antenna height is all important.

An approximate rule-of-thumb for calculating transmission (or reception) range, subject to a variety of factors, is that vhf and uhf signals propagate a distance of $4/3\ H$, where H = distance to the horizon.[16]

The distance to the horizon can be calculated by

$$D = 2Rh + h^2$$

where

D = line-of-sight distance from the observing point to the horizon.
R = radius of the earth to the average terrain surrounding the observing point.
h = height of the observing point above the average terrain.[17*]

Fm repeater frequencies are "channelized," and each repeater has at least one input and one output frequency. When W1AAA transmits on the repeater input frequency, the repeater essentially amplifies the incoming signal and retransmits it on the repeater output frequency where W1ZZZ is listening. The process reverses when W1ZZZ answers W1AAA. The construction of the repeater permits simultaneous reception and transmission of the signals by spacing the input and output frequencies 600 kHz, or in some cases 1 MHz, apart. See **Fig. 1**.

Fm repeater frequencies

The fm repeater portion of two meters is channelized into repeater and simplex frequencies on 30 kHz spacings (**Table 3**).

Simplex operation does *not* involve the use of a repeater, but alternating communications on a common, single, frequency just as CBers communicate on a particular channel. Common practice is to use 146.52 or 146.94 MHz as a simplex frequency, except in areas where a repeater might use the latter as an output frequency. Although I've not seen any studies on what would be the most popular simplex frequencies, personal observations would rank 146.52, 146.58, and 146.55 MHz, in that order, as most popular.

Simplex frequencies (**Table 3**) are spaced in between repeater input and output frequencies. Repeater frequencies are set by voluntary Amateur cooperation. There is nothing in the FCC Rules and Regulations limiting

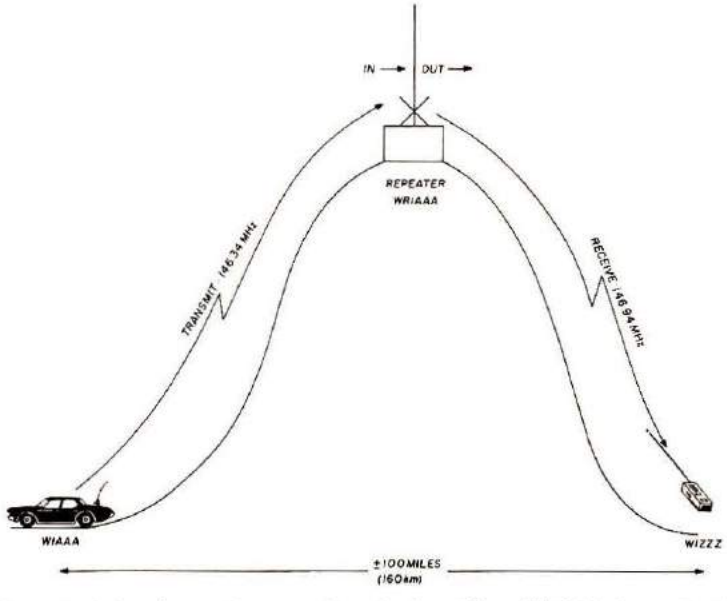


Fig. 1. The principle of repeater operation. A signal from W1AAA is received by the repeater on its *input* frequency, amplified, and retransmitted by the repeater on its *output* frequency where it is received by W1ZZZ. Since the input and output frequencies are different, no interference is caused at the repeater, and simultaneous reception and transmission can take place; since the mobile and hand-held are transmitting and receiving on different frequencies, they do not interfere with each other.

*You may use any units of measure you like, provided that the same units are used consistently throughout the equation. The answer will be in the same unit.

An idea of the coverage of amateur repeaters across the country is given by this map. The shaded areas are based on an estimated 35-mile (56km) radius coverage area centered on the repeater location. Some repeaters will exceed this figure, and some will have coverage patterns shaped to include a specific area to the exclusion of others. Information based on the 1976/77 *ARRL* Repeater Directory listing.

the choice of repeater frequencies within those band segments allotted for repeaters. Amateurs in the various sections of the country act as "area frequency coordinators" to suggest repeater assignments and minimize interference on the same or adjacent channels. A current list of frequency coordinators is available from the American Radio Relay League, Newington, Connecticut 06111.

The two-meter band plan[18] is firmly entrenched now, and area frequency coordinators have things under reasonably good control by advising on choice of band, frequency, and location. As with troublemakers anywhere, there are a few Amateurs or Amateur groups who install repeaters without consulting the coordinator, but peer-group pressure will usually encourage behavior modification. Eventually, the repeater is moved to a "coordinated" status, following appropriate changes.

In the crowded metropolitan areas, there are 1-MHz "splits" having inputs between 147- and 148-MHz, and outputs between 146- and 148-MHz; arranged high-to-low (input/output) so that simplex operation does not activate the repeaters. In many areas of the country, 15-kHz "split-frequency" assignments have been made between the 30-kHz assignments. Except in California, the 15-kHz splits — frequencies ending in the digit 5 — run in the same direction as the 30-kHz assignments. In California, the splits are inverted with respect to the 30-kHz allocations.

What are the most popular repeater frequencies? Mathematical studies indicate that with four pairs of crystals you can operate almost half of the available two-meter repeaters in existence.[19,20] See **Table 4**.

Table 4. The popular repeater frequencies are listed in ranking order below. Note the practice of dropping the leading prefix "146" or "147" and the decimal point, and referring only to the suffix. If two frequencies are given, the repeater input frequency is given first, followed by the output frequency. If one frequency is given, it is the output frequency with the 600-kHz spacing understood. For example, 34/94 or 94 refers to 146.34 in — 146.94 out; 96/36 or 36 refers to 147.96 in — 147.36 out.

In order of popularity		
34/94	19/79	01/61
16/76	25/85	04/64
22/82	07/67	10/70
28/88	13/73	37/97

Cooperation on CB

Class-D operators don't have repeaters, and with the crowded frequencies, there are many arguments and fights — yes, even shootings — over who has the "right to the channel." One such murder was within two miles (3km) of my home, and that channel was rather quiet for a while thereafter.

Fortunately, common sense prevails with the majority of users. A local CB club in Willingboro, New Jersey, for example, has discouraged the constant banter on one frequency by the simple action of *not* acknowledging the continuous requests for a 10-36 (time check) or a "radio check." The frequency is now relatively clear for base-to-mobile communications within the township.

"Col. Klink," otherwise known as Sgt. Paul Solow of the Willingboro Police Department, has taken up residence on channel 19 to perform three functions: 1) to warn motorists of traffic hazards; 2) to reduce vehicle speeds; and 3) to educate the public to road safety habits.[21] "Klink" is just one example of the growth of the use of CB by police departments at the local, county, and state levels.

Recently the Federal government has made grants available to law enforcement agencies to install CB-monitoring equipment at various base station installations, and some additional funds are being set aside for educational and training programs for the CB motorist. By early 1977, the

An increasing number of police departments are taking advantage of CBs ability to reach the average motorist for reasons of safety and emergency messages. This Missouri State Highway patrolman monitors channel 9, and uses the call KMO-0911. The 911 number is a reminder that in many areas you can reach help quickly by dailing those digits (*photo courtesy Missouri State Highway Patrol*).

Table 5 — Preferred CB channels.

Channel	8	Agricultural operations
Channel	9	Emergencies only (FCC-designated channel)
Channel	13	Maritime
Channel	15	Motorcyclists
Channel	16	Ssb operations only
Channel	18	Ssb operations only
Channel	19	Motorists/ truckers in transit
Channel	36-40	Ssb operations only

New Jersey State Police will have 21 posts capable of monitoring emergency channel 9, and all three dispatching points (Newark, New Brunswick, and Moorestown) for the New Jersey Turnpike will be covered.[22]

This kind of activity has already taken place in a couple of states, with Ohio and Missouri being prime examples of what can be done. Other groups have identified themselves with certain channels,[23] detailed in **Table 5**, but there is nothing in the FCC Rules and Regulations to dictate such use. The one exception is channel 9, the FCC-designated emergency channel, which has had a rocky — but basically successful — history.[24]

Even with the expanded 40-channel band, frequencies are still crowded. Limiting conversations to those that are necessary and purposeful, and keeping transmissions as short as possible, are keys to giving all a chance to use the channel. Courtesy and patience are virtues that are too often ingored.

Cooperation on two-meter fm

Hams have the ability to do a variety of things not available to Class-D CB operators, but they, too, have problems.

In years past, there have been repeater "wars," particularly in the large metropolitan areas, between coordinated and uncoordinated repeaters. With the growth in occupancy of the two-meter band, and increasing pressure, problems have increased.

There have been some unfortunate arguments on repeaters about how to locate stolen sets. From time to time (unfortunately, the problem seems to be increasing) 2-meter sets are being stolen from automobiles and sold as CB sets to unknowing individuals. Out of frustration, and sometimes deliberately, these unlicensed individuals "jam" a repeater. When this happens, many of the repeater users face a period of frustration until the situation is resolved. Fortunately, many clubs have members with enough technical savvy to work out a methodical approach to apprehending the individual who is causing the disruption. Although the FCC rules prohibit an amateur from talking with an unlicensed station,[25] there has been relatively little enforcement of this where the purpose has been to recover stolen gear or to apprehend a jammer.

In defiance of the spirit of cooperation, some Amateur groups "close" their repeater. Devices known as tone-burst generators producing audible frequencies around 2-kHz or systems producing subaudible

Many amateurs convert equipment that was once used in commercial service so they can be used through vhf repeaters or remote base stations. A control head, like this Motorola unit, and a tone-generating control panel (for control purposes) are often seen in mobile installations (*photo courtesy W6JYP*).

Even when he is walking, an amateur can extend the range of a 2- to 5-watt portable transceiver by taking advantage of a repeater a few miles away. This feature not only adds to the pleasure of casual hamming, but also helps in emergency situations where it is impossible to reach the scene except on foot (*photo courtesy R. L. Drake Co.*).

tones prevent just anyone from accessing a particular repeater. Unfortunately, some "closed" repeaters occupy the more commonly-used repeater frequencies (**Table 4**). To activate a "closed" repeater, a 2-meter transceiver must contain an appropriate device to trigger that particular repeater.

Fortunately, such situations are minimal. I can sympathize with repeater owners and operators who put up time and money to construct a properly operating machine, and then object to local freeloaders who tie it up. But, a few proper comments can go a long way toward building friendships and reducing conflicts.

There are other reasons for using a tone-access repeater, particularly in the large metropolitan areas where there are simply not enough repeater frequencies to go around. This leads to repeaters being located close to the coverage area of each other, with the result that some mobile stations will unavoidably open more than one repeater when they transmit. In a note-worthy effort to maintain local control but still maintain emergency

communication capability, some area clubs use individual tones for their particular repeater, and also have a common "all-call" tone to permit a motorist in trouble to summon help, even if he is out of range of the repeater he normally uses.

Although I disagree with the concept of closed repeaters, one solution that closes a repeater to "locals" but makes it available to travelling hams, is exemplified by WR2ADJ, 146.16/76, in Sayreville, New Jersey, near New Brunswick. The repeater has a second, carrier-accessible, input receiver located near the New Jersey Turnpike. The input receiver activates the repeater three consecutive times before shutting down for a short time; a member, with PL (Private Line), can talk with that transient Amateur — *PL* to non-*PL* — to render assistance.

Autopatch

Personal-use telephone capability is available to hams through repeaters. The two-tone frequencies generated by *Touch-Tone** pads can control repeater functions, including connection to, and release from, telephone lines, assuming the necessary circuitry is installed on the repeater.

Most autopatch systems are limited to member use even though the repeater itself may be open. Most repeater groups whose repeaters are autopatch equipped will activate the telephone lines for non-members with emergency traffic. There are a few repeaters with autopatch facilities that are open for any ham, having a *Touch-Tone* pad, to dial 911 (where that emergency-service number exists) should the need arise. Again, this kind of public-service spirit can only survive with cooperation.

Autopatch capabilities are expensive, and telephone charges consume a large chunk of any sponsor's budget. Accordingly, an autopatch should be used only for non-business personal messages of importance, and not just idle chit-chat. If you have any questions on the functioning of the autopatch on a particular repeater, a control operator monitoring the repeater will answer any questions about the system.

*Touch-Tone is a registered trademark of the American Telephone and Telegraph Company.

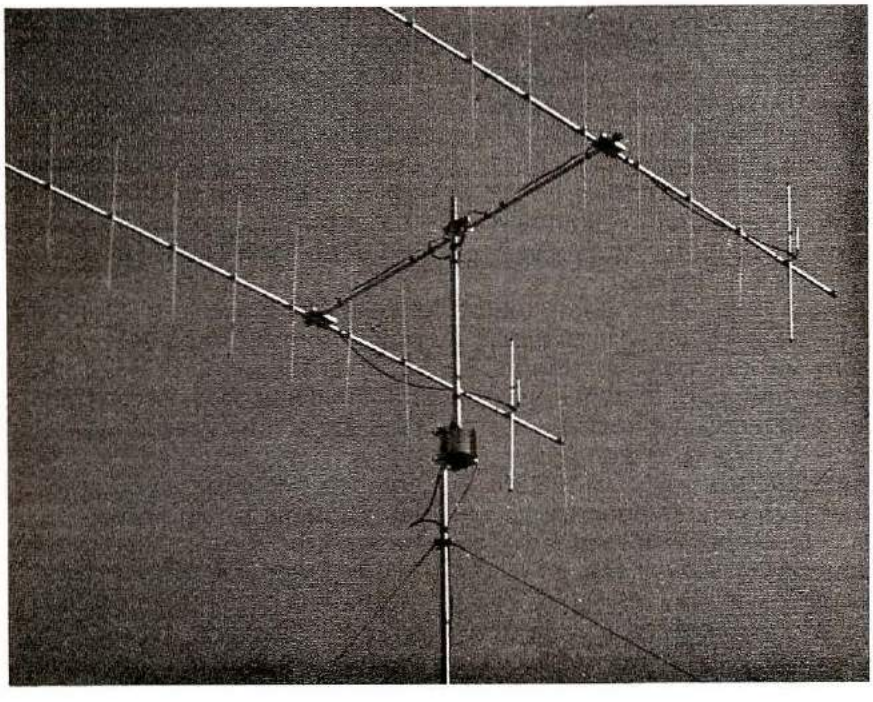
Operating

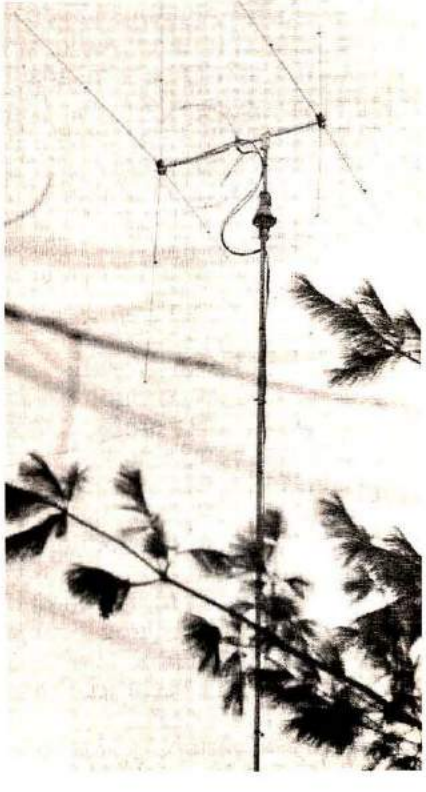
Operating procedures are markedly different between CB and the two-meter Amateur fm band.

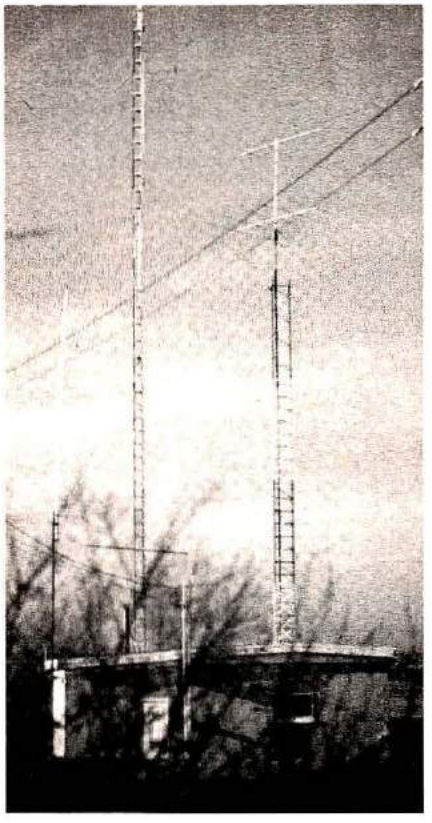
The method of striking up a conversation on CB is usually to say "Break, Channel 19" (or whatever channel is being used), "This is KOG—2427", although there is nothing in the FCC rules to state that you must ask for use of the frequency. Usually someone will respond "C'mon Breaker" and the conversation is started.

Recent changes in the FCC rules state that the operator need only identify his own station with the assigned call, a "handle" may be added to the identification, at the "beginning and the end of each transmission or series of transmissions, but at least at intervals not to exceed

The CB 2-element quad, right, is large and bulky requiring a heavy duty rotor and multiple guy lines, whereas the 2-meter 22-element beam, below, is somewhat smaller, lighter, and easier to install. The 22-element beam performs well for both simplex and repeater frequencies.







W2ZQ's (Delaware Valley Radio Association's) location is outside Trenton, New Jersey on high ground, housing the WR2ADE repeater and other hf and vhf equipment for club members. The repeater tower is the tallest one in the middle of the photograph.

ten (10) minutes."[26]

On the lower Amateur bands (10-160 meters) it is common practice to call *CQ* as a means of announcing an intent to begin a contact with another station. This is not so on repeaters, where acceptable practice is to say, if the repeater is not in use, "WB2AYA Listening" or "This is WB2AYA Listening on 94" (the frequency given is the output of the repeater or the simplex frequency, dropping the 146- or 147-MHz prefix).

To join an already-in-progress conversation on CB, common practice is to say break and then wait to be acknowledged by one of the stations.

On many repeaters, the term *break* should *not* be used except in emergencies. The proper way, if you must join the conversation in a non-emergency situation, is just to insert your call once in the momentary silence between one station turning over the conversation to another, and wait to be acknowledged.

It is a good idea, when using a repeater, to delay — for two or three seconds — between transmissions to permit someone else to access the repeater, either to join the conversation or to get help in an emergency situation.

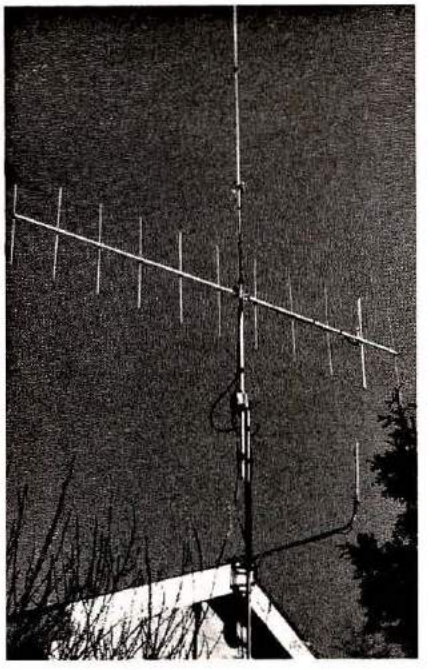
Some repeater groups firmly and politely insist upon this rule — and it's a good one.

Just as some CB channels have taken on certain characteristics (**Table 5**), some fm repeaters have developed reputations for a particular type of activity.

Repeaters can be local or regional in coverage, and some have special interests. For example, WR2AHM, 146.265/865, in Pine Hill, New Jersey, is dedicated to autopatch use by members in the Camden County area. On this repeater autopatch carries top priority, excepting emergencies, over all other contacts in progress, which must cease while the member makes his non-business telephone call.

Another kind of service — a wide-area regional coverage — is provided by WR3AHZ, 146.385/985, in Parkesburg, Pennsylvania, placed at one of the higher spots between Valley Forge and Lancaster. Until the high-power WR3AHZ came on, there was difficulty in obtaining adequate repeater coverage in parts of Chester and Lancaster counties, Pennsylvania and in Cecil and Hartford counties, Maryland.

Repeaters develop "personalities" too. Some tend to be rather quiet with two or more stations participating in longer-than-normal conversations, whereas others are limited to short, in-and-out, contacts. WR2AHU, 147.96/36, New York City, is an extremely busy machine with stations jumping on and off the frequency all day long; but, by 10 PM each night, a couple of Amateurs establish a semi-formal roundtable which somewhat stabilizes the utilization pattern.



An omnidirectional antenna can be installed atop a beam, if roof space is limited, when operating two-meters. The antenna on the lower right is for the VHF (152-174 MHz) Public Service Band.

When operating a repeater for the first time, the new user should determine if there are any special operating rules — such as a 3-second pause, or autopatch priority — and the length of its timer.

A timer is a device to prevent the transmitter in the repeater from coming on and staying on the air, either by accident or on purpose (yes, it happens). A timing circuit disengages the repeater transmitter after a preset period of time. Repeater timers can reset on the input or the output frequency, depending upon the circuitry used.

The first-time listener to a repeater will notice a burst of noise from the repeater receiver following the end of a transmission, but before the repeater transmitter shuts down. That burst, known as a squelch tail, can be varied in length by settings on the transmitter.

If the repeater timer resets on the input, the squelch tail will be longer and the replying station can pick up the conversation without letting the

repeater transmitter drop off the air. If the repeater resets on the output, the replying station must wait for the second squelch indicating the repeater transmitter had also stopped transmitting. Failure to wait for the second squelch will result in timing out the repeater, when the whole system shuts down and goes through a recycling process.

Many heavily-used repeaters, such as WR2ADT, 146.34/94, Greenbrook, New Jersey, have timers that time-out the repeater in less than one minute, but the norm is a 3-minute timer. A rule-of-thumb is to keep transmissions short and to the point, one topic at a time, especially during commuter-travel periods in the morning and evening. Mobiles and portables should have priority over high-powered base stations in use of repeaters during such periods.

It's not a bad idea, when possible, to use simplex in lieu of a repeater, and leave the repeater free for those who need it.[27] It's rather silly for base stations within a couple of miles (3km) of each other to tie up an area repeater in a lengthy conversation. Keep the repeater open for the low-powered mobile and hand-held units that can use the extra help afforded by a repeater.

Emergencies

In the establishment of the Citizens Radio Service for personal and business use, the FCC recognized its potential for providing communications during times of emergencies.[28] FCC Rules and Regulations for the Amateur Service also include, as part of the definitions of the service, a statement on public service in times of emergencies . . . in fact, that is the first definition given.[29]

Activities along the New Jersey shore during Hurricane Belle's visit of August 8-9, 1976, were representative of the kind of assistance CBers and hams can render in times of disaster. What took place in New Jersey has been repeated over and over again elsewhere . . . the tornados in Ohio, and the hurricanes making landfall along the Gulf Coast.

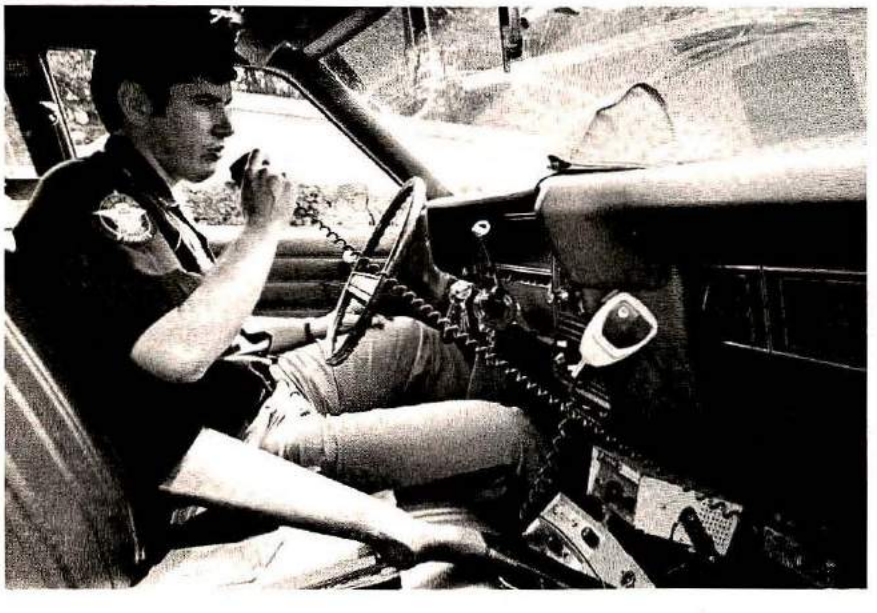
Quite frankly, the clutter of hetrodynes caused by a large number of operators attempting to use a single CB channel limits communications to relatively short distances, but that doesn't stop CBers from giving a hand. During Hurricane Belle, CB communications coordinated the movements of Red Cross vehicles on Long Beach Island, and provided communications between the vehicles and headquarters at the Long Beach Island municipal building. From that control point, 2-meter fm stations relayed messages 20 miles (32km) north to Ocean County Civil Defense headquarters in Toms River, New Jersey.

Depending upon the nature of the request and its destination, some messages were relayed across the state on two-meters and others were put into the NTS (National Traffic System) via the New Jersey Phone Net on the 75-meter Amateur band.

At the same time in the Philadelphia area, a flood watch was set up on most of the suburban creeks known to have a history of overflowing their banks in low lying areas.

Channel 9 is the generally recognized nationwide emergency calling frequency on CB. Volunteers often monitor this channel around the clock, and in some areas the police use this channel for fast response to trouble calls from motorists. Much good publicity for CB is generated by signs like this one posted near the city or town limits (*photo courtesy CB Life Magazine*).

Although a major use of CB in the car was to give out "Smokey" reports, police were quick to recognize it as a way of getting in direct contact with the motoring public. Many travelers are glad to be advised of hazardous conditons or traffic problems ahead, allowing them to seek a different route. An E. F. Johnson CB unit takes its place under the dash for this officer in the Sheriff's Department in Northern California's Sumter County (*photo courtesy CB Life Magazine*).



CB mobile units were stationed along the various streams, and local communications, at each stream site, was coordinated by someone with both CB and 2-meter equipment. Information, via fm, was passed on to county disaster-control agencies.

Public-service work is not limited to emergencies. Newspaper, radio, and TV stories recount, daily, the incidents of hams and CBers locating lost children, helping the handicapped, and coordinating bike-a-thons and walk-a-thons for charity. Hams and CBers, together and separately, have assisted in these exercises. The media doesn't always assign credit to the proper group, but the end result of a job well done is the same.

Travelling

If there is any one single justification for having a CB set, it is putting it in the car when driving the open road!

There are now approximately 9-million station licenses issued in the Citizens Radio Service[30] — which means any family member or employee of the business can pick up a microphone.

Contrast this with less than 300,000 licensed Amateur radio operators *eligible* to operate on two-meters,[31] and with only a small percentage of those amateurs actually operating on the band, and the point becomes clear.

The odds of finding a local mobile station, or a base station near your location, is much higher on CB than on 2-meter fm. In a situation where emergency help or specific directions are needed, you are more likely to find immediate and local response on CB.

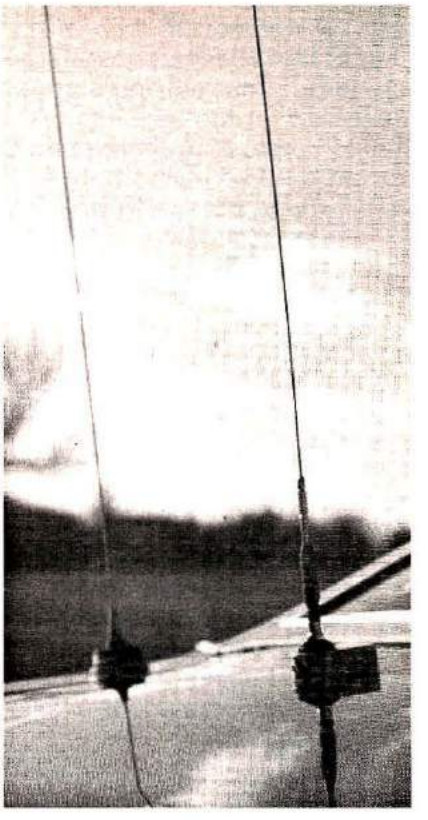
CB's drawback is its short effective transmitting range. On channel 19, or channel 10, in some areas of the country, the range can be less than a mile (1.6km) because of interference from local and skip stations.

In the Northeast Corridor, where Amateurs have continuous coverage of the terrain by repeaters, the probability is still high that the replying station may be located many miles away and relatively unable to render immediate assistance — even if required.

The situation is worse elsewhere. The Amateur travelling through North Dakota, for example, can travel for 200 or 300 miles (300-650km) between areas of repeater coverage, and seldom can anyone be found on the national simplex calling frequencies of 146.52 or 146.94 MHz. High-frequency band (80- through 10-meters) equipment is the order of the day for Amateur mobiles in the wide-open spaces.

A Technician Class licensee (but not a General or higher class, licensee) has an additional problem when travelling in Canada. Whereas CB licensees may operate under Tourist Radio Service rules, a Technician cannot operate under reciprocal Amateur licensing agreements because Canada has no license comparable to the Technician ticket.

At the time this is being written, however, the Canadian Department of Communications (DOC) is considering an Experimental Amateur Radio Operator's



No apparent degradation of antenna performance on either CB or two meters is noticed, despite the close proximity of mobile antennas.

In addition to repeaters, amateurs in many areas use remote base stations. These stations make use of a good location and antenna to relay signals from amateurs in poor locations, and often do so on an amateur band that is different from that used by the amateur in his home or mobile station. The use of remote base stations is not necessarily restricted to vhf, and control and access can be by either wire (telephone lines) or radio signals (*photo courtesy W6JYP*).